

SEDIMENTARY ROCKS

Cenozoic

Quaternary—Recent deposits of the last 10,000 years are chiefly beach sands forming Sandy Hook and the offshore bars. Pleistocene or ice age starting 1,000,000 years ago. Widespread thin deposits of till and outwash covering older formations are not shown on this map. Mineral production—peat moss, sand, and gravel.

Tertiary—Starting 70,000,000 years ago. Unconsolidated sands, gravels, and clays. Forms the outer Coastal Plain. Marked by three different periods of invasion by sea, separated by erosional periods of dry land. Mineral production—brick and terracotta clays; glass sands; ilmenite (titanium ore).

Mesozoic

Cretaceous—Starting 125,000,000 years ago. Unconsolidated sands, clays, and greensand marls. Forms the inner Coastal Plain. Appalachian Province uplifted and coast depressed; fast moving rivers deposited sediments in marine environment. Mineral production—fireclay, brick clay, greensand marls.

Triassic—Starting 200,000,000 years ago. Shales, argillites, sandstone, and some conglomerates. Forms Piedmont Plain. Appalachian Mts. uplifted and long thin depressed basins formed between ridges; fast moving rivers deposited sediments in these basins. Mineral production—Stockton sandstone (brownstone) for building stone; negligible amounts of copper found in some shales.

Paleozoic

Devonian—Starting 330,000,000 years ago. Sediments occur in two areas, 1) fossiliferous, calcareous shales and limestones in Appalachian Plateau, 2) sandy shales, sandstones, and conglomerates in valley south of Greenwood Lake in Highlands. No significant mineral production.

Silurian—Starting 360,000,000 years ago. Coarse conglomerates, sandstone, shale and, limestone. Occur to the southeast of Devonian sediments. From early Devonian, when sea receded to early Upper Silurian, N.J. was dry land. In late Silurian, the sea receded for a very short period and then re-invaded land. No significant mineral production.

Ordovician—Starting 420,000,000 years ago. Limestone, shales, and slates. Found in the Highlands and Appalachian Plateau. Three different invasions of land by sea, with erosional periods of dry land in between. Mineral production—cement rock and slate.

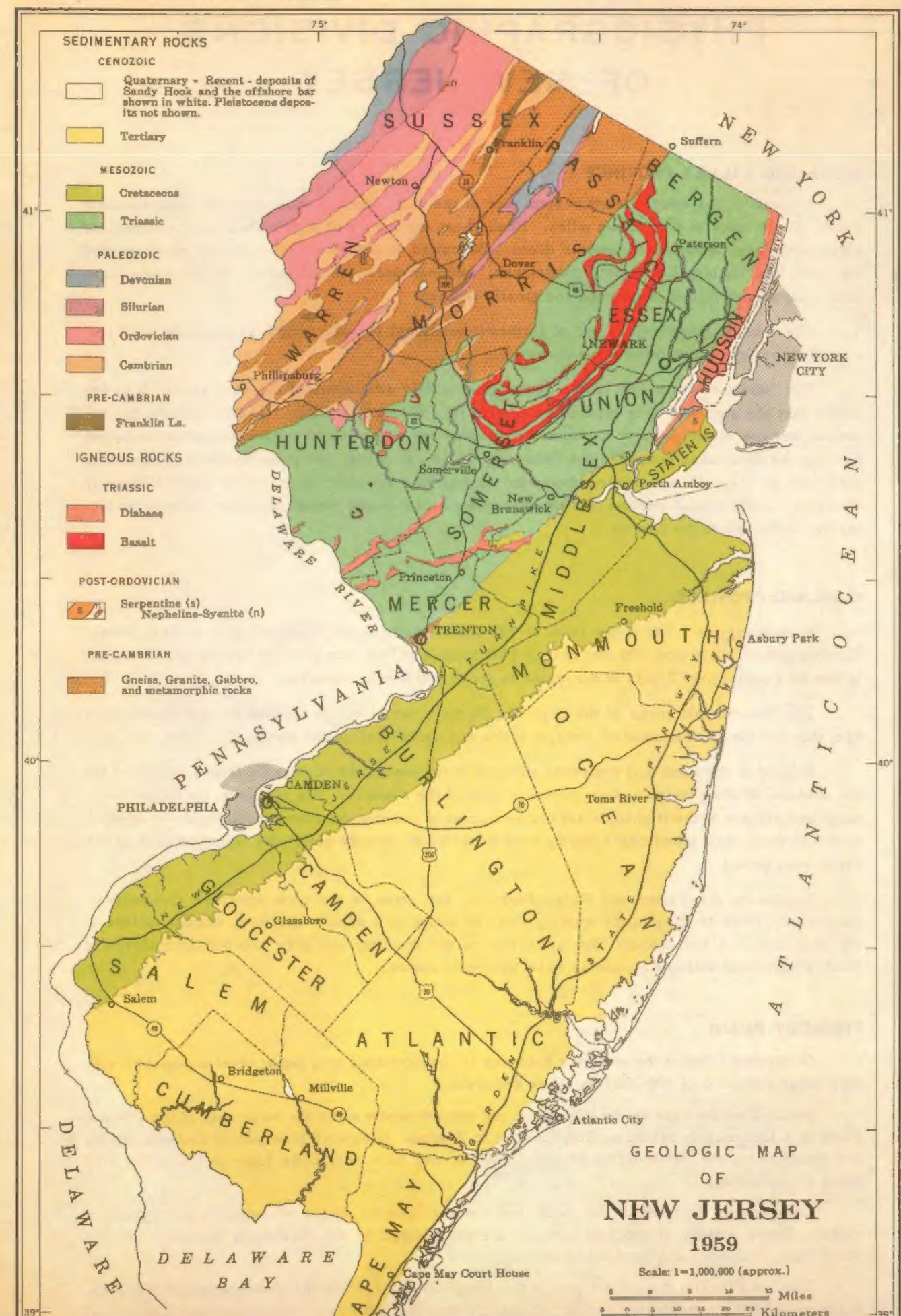
Cambrian—Starting 500,000,000 years ago. Quartzite followed by limestone. Found in the Highlands and Appalachian Plateau. During first and last parts of Cambrian time N.J. was covered by seas, while in Middle Cambrian time it was dry land.

Precambrian—Franklin limestone—more than 500,000,000 years old. Typically a white crystalline limestone. Found in a narrow belt and a few isolated masses in the Highlands. Mineral production—zinc deposits at Franklin and Ogdensburg; limestone for flux and cement rock.

IGNEOUS ROCKS

Triassic—Diabase and Basalt—The same basic rock formed from cooling molten material. Differ in texture. Diabase is coarse grained due to slow cooling beneath the surface while basalt is fine grained due to quick cooling of lava at the surface. Diabase forms the Palisades and its extensions to the south in the Princeton area. Basalt forms the Watchung Mts. and the two small masses at New Germantown and Sand Brook. Diabase and basalt are extensively quarried for concrete, road metal, and railroad ballast.

Precambrian—Gneiss and Granite. Granite is a coarse grained igneous rock characterized by predominant alkali feldspar and quartz. Gneiss is a crystalline rock with a secondary rough foliation developed as a result of pressure on the solidified rock; bands or lenses in gneisses are commonly unlike. Metamorphic rocks are included in this zone, some of them having been derived from sediments. These rocks form "The Highlands of New Jersey". Mineral production—magnetite (iron ore), crushed stone and prospects for uranium, monazite, and rare earths.



PHYSIOGRAPHIC DIVISIONS OF NEW JERSEY

RIDGE AND VALLEY PROVINCE

Located in the extreme northwestern part of the state, the province occupies approximately 1/12th of the state or 635 square miles. Found here are early and middle Paleozoic sedimentary rocks with local intrusion of igneous dikes. Deposited in the Paleozoic sea that once covered the area, the shales, limestones, sandstones, conglomerates and siltstones of the region have been compressed, folded, overturned and greatly crushed.

The present landscape is one of northeast-southwest trending ridges of resistant rock paralleled by valleys which formed on softer rock.

The Delaware Water Gap is one of the great scenic attractions of the east coast. It is believed that the area was once reduced by erosion to a featureless plain. On this surface, the ancestral streams of the province meandered over the level plain. Great crustal disturbances began pushing the land mass upward. The Delaware, which cut across the grain of the rock structure, persisted in its path and eroded downward through the resistant rock which forms Kittatinny Mountain. Longitudinal streams flowing over softer rocks, easily etched out their valleys producing the landscape of the present.

HIGHLAND PROVINCE

Accounting for 1/8th of the state or 900 square miles is the Highland Belt of New Jersey. Elevations here range from 200 feet east of Phillipsburg to 1496 feet between Vernon and Canistota in Sussex County; over 2/3rds of the region is above 500 feet in elevation.

The metamorphic rocks of the Highland Belt are the oldest in the state. Pre-Cambrian in age, they are the foundation of all younger rocks and underlie all of the state.

Rugged in the north and somewhat subdued in the south, the Highland's ridges are noted for the absence of sharp peaks and the flattened tops of the summits. The gneisses, crystalline limestone and schists of the Highlands are not horizontal in position but stand at all angles in relation to the surface, their tilted edges having been bevelled by erosion during the peneplanation of the Cretaceous period.

Similar to the Valley and Ridge Province, the grain of the rock structure is northeast-southwest. Down-faulting or the wearing away of softer rock explain the long, narrow valleys of the Highlands. A few streams flow transverse to the structure and their steep-walled cloves or valleys have been utilized by man as major east-west routes.

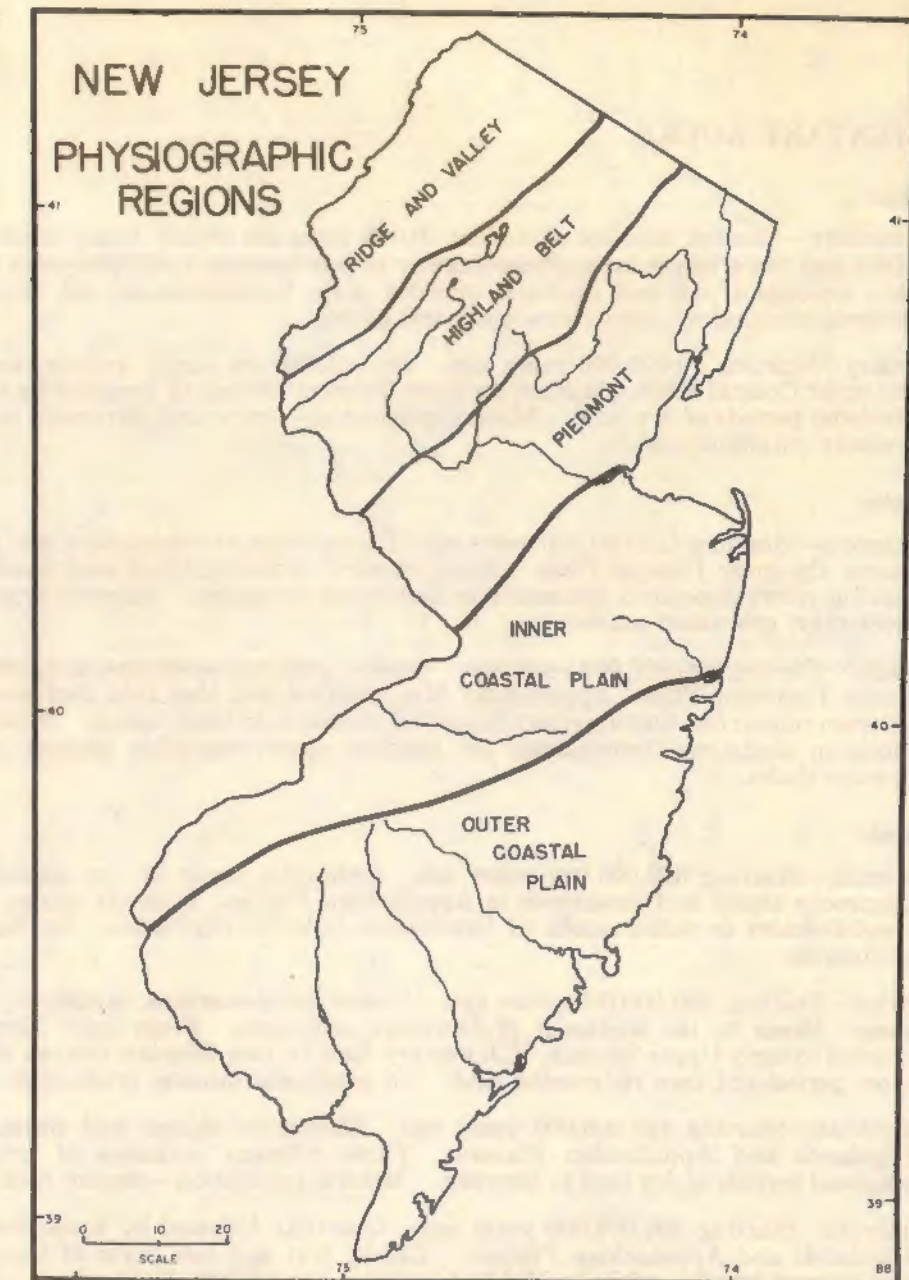
PIEDMONT PLAIN

Occupying 1/5th of the area, the Piedmont is characterized by a rather level topography with an average elevation of 100-200 feet above sea level.

Bounded on the west by the Highlands, the eastern border abuts the sediments of the Coastal Plain on a line roughly extending from Carteret to Trenton. Composed primarily of Triassic shales and sandstones, the Piedmont is 12 miles wide on the New York State Line and 32 miles wide along the Delaware.

Conspicuous features of the landscape are the igneous ridges of intrusive and extrusive rocks. These effects of volcanic activity are represented by the Cushetunk Mountain and the Watchungs, Palisades and Sourland Mountains.

The low relief in the greater part of the Piedmont has favored the development of railroads, highways and the concomitant use of the land by man for industries, residences and commercial



COASTAL PLAIN

Located southeast of the Piedmont, the Coastal Plain is the state's largest physiographic province occupying 3/5ths of the land area.

The rocks here are unconsolidated sediments of Cretaceous to Recent Age. At the beginning of the Upper Cretaceous the sea advanced over the eastern edge of the continent, into these waters rivers from the western mainland deposited the clays and sands which form the oldest formation of the province — the Raritan. Succeeding years saw a series of uplifts accompanied by erosion and a series of inundations accompanied by deposits of sand, clay and marl.

Since the Coastal Plain structures dip to the east at a rate of 50 feet per mile, the oldest outcrops occur adjacent to the Delaware River and the youngest deposits are on the sea coast. Thus the surface structure is one of northeast-southwest trending outcrops of unconsolidated sediments — bevelled by erosive forces.

In the better soil areas of the coastal plain there is much agricultural activity. The areas major contribution to the state's economy lies in its deposits of clay, gravel and sand, especially glass sand.